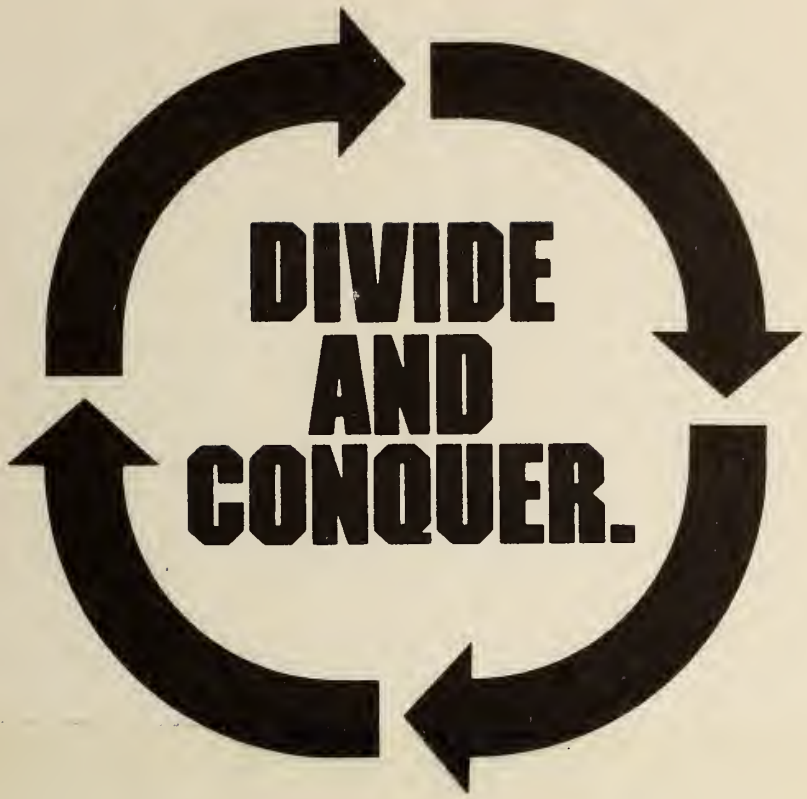

A Teacher's Guide to Waste Management

Grades 7—10

Ontario
Ministry of the Environment
Hon. Harry C. Parrott, D.D.S., Minister
Graham W. S. Scott, Q.C., Deputy Minister

Ministry
of the
Environment
Ontario

To the Teacher:

This package of teaching resource materials has been assembled by the Ontario Ministry of the Environment as part of their environmental education program. The purpose of this manual is to provide teachers of Grades 7-10 with background information and classroom activities on the broad topic of solid waste. The activities first explore our current throw-away habit and the resulting waste of valuable resources. Then the activities focus on what can be done to conserve and recover the resources we are wasting.

This unit is appropriate for adaptation into an existing intermediate general science program and could be completed in three to four weeks depending on the scope of activities undertaken. It was originally tested in 1978 in several schools in Etobicoke, Toronto, Georgetown and Aurora. These communities were involved in the "Divide and Conquer" Program initiated by their Municipal Works Department and the Ontario Ministry of the Environment. For more information on this program see Section I - The Ontario Ministry of the Environment's Waste Management Program.

We hope that this teaching resource package provides practical bread-and-butter activities which are suited to your existing science or social studies programs. Comments and evaluations are welcomed.

Educational Resources Co-ordinator
Information Services Branch
Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

About the Cover: Divide and Conquer

This title was chosen to convey the idea that if people learn to "divide" their garbage (separate it at source), they will be able to "conquer" (overcome) present day problems related to disposal and resource depletion.

ACKNOWLEDGEMENTS

In preparing this "Divide and Conquer" teacher's kit, we have been grateful for the assistance of the following:

- Office of Energy Conservation, Department of Energy, Mines and Resources Canada, 580 Booth Street, Ottawa, Ontario for copies of "Garbage Gus", The Garbage Book, and Superkids.

- Ontario Science Centre, 770 Don Mills Road, Don Mills, Ontario for "Papermaking ... how to go about it", and assistance in the Composting activity.

- Alberta Environment, Communications Branch, 9820-106 Street, Edmonton, Alberta, T5K 2J6, for information on educational materials developed in western Canada on the topic of solid waste.

- John Madama, formerly of "Steppingstones", Somerville, Massachusetts for permission to use ideas and activities from Recycle which he developed under a grant from the U.S.A. Environmental Protection Agency.

- Environmental Action Coalition of New York, N.Y. on whose original work for the Don't Waste Waste curriculum Mr. Madama (above) based a major portion of his work.

Ministry
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Ontario

"DIVIDE AND CONQUER"
TEACHER'S KIT (7-10)

CONTENTS

I. THE ONTARIO MINISTRY OF THE ENVIRONMENT'S WASTE MANAGEMENT PROGRAM

In 1970 the Ontario Ministry of the Environment assumed responsibility for waste management across the province and via the Environmental Protection Act of 1971 began planning, designing and implementing a co-ordinated program to deal with all aspects of Ontario's waste.

While the original objectives of their programs - to cover open garbage pits and close many undesirable disposal sites - were achieved, other problems have appeared. The amount of waste materials produced by our "throwaway" society is rapidly increasing; suitable landfill sites are becoming harder to find; and, valuable resource materials are being wasted when we bury them as garbage.

In 1974, for example, in Southern Ontario five million tonnes of garbage were produced by seven million people. This works out to a rate of 2 kg (four pounds) of garbage per person per day.

Assuming an annual increase of four per cent, solid waste would expand to 16 million tonnes in the next 20 years.

Equally important is the waste of resources and energy this garbage represents. We throw away more than two-and-a quarter million tonnes of paper and half-a million tonnes of metal every year. Two-and-a third million tonnes of this waste is packaging material.

OBJECTIVES

To deal with this enormous problem, the Ministry has established several new objectives:

1. to reduce the quantity of waste produced;
2. to recover to the greatest extent practical, resource materials and energy values contained in waste;
3. to reduce to a minimum the use of land for waste disposal;
4. and, to assist communities in the education of their residents about the concept of resource recovery and their roles in source separation.

KEY PROGRAMS

There are a number of key programs by which the Ministry hopes to achieve its objectives.

I. MUNICIPAL ASSISTANCE

Environment Ontario offers municipalities a 50 per cent subsidy for the construction of resource recovery plants with 40 - year financing of the balance of capital costs. This financing should make it possible for a municipality to invest in a $15 million plant to reclaim metal, paper, cardboard and fuel from a 1,000 ton per day plant.

II. ONTARIO CENTRE FOR RESOURCE RECOVERY

As recycling and reclamation ultimately depend on reliable markets for the reclaimed goods, the Ministry is attempting to establish and to develop these markets through its Centre for Resource Recovery in Downsview, Ontario.

This $14.5 million facility is a functioning Resource Recovery Plant capable of handling up to 600 tons of refuse on a two-shift a day basis. Equally important, it is the laboratory in which various technologies and methods are tested and proven

with the aim of producing a wide range of separated materials and fuels for market development.

The plant has been functioning efficiently since 1978 as a transfer station for Metro Toronto Garbage, handling as much as 900 tons a day.

Separated paper and light combustible wastes processed through the plant are now being used as a fuel enrichment in The Canada Cement LaFarge Kilns in Woodstock replacing some of the coal normally used. Eventually the refuse-derived fuel (RDF) should replace fifty per cent of the coal.

If this experiment succeeds, it will provide a good, stable market for refuse-derived fuel and the cement company's fuel costs will be reduced.

Another promising market for reclaimed paper from the Resource Recovery Plant is its potential for use as insulation material.

Reliable markets for reclaimed steel are also being developed through the secondary metals industry.

III. SOFT DRINK CONTAINERS

To reduce solid waste and conserve energy, Ontario has also legislated a regulation to restore the Province-wide availability of soft drinks in refillable containers.

By law, Ontario residents are guaranteed the right to purchase carbonated soft drinks in refillable bottles and to return empty bottles and receive a cash deposit from all retail vendors who sell pop.

The Soft Drink Industry has also agreed to return the market-place to a state of 75 per cent refillable containers.

IV. AREA WASTE MANAGEMENT STUDIES

The Ministry is also financing a number of area waste management studies to improve existing waste management systems and to determine the suitability of resource recovery plants in various

communities around the province as well as the proper timing for any development of the facilities.

V. SOURCE SEPARATION BY HOUSEHOLDERS

Throughout 1978 and '79 a project entitled "Divide and Conquer" was initiated under the joint efforts of Environment Ontario and the Municipal Works Departments in four Ontario municipalities - Georgetown, City of Toronto, Aurora and Etobicoke - to establish the best method of encouraging residents to separate newspapers, bottles and cans at "source" (in their homes) for eventual recycling.

The Ministry undertook the co-ordination and research aspects of the overall program while each municipality's Works Department was responsible for the actual collection of the separated newspapers, glass and cans.

Depending on several factors, the Works Department in some communities picked up the source separated materials at curbside just as it did with the regular weekly garbage and in other communities, householders took their separated materials to central depots.

A report on the "Divide and Conquer" program, which will present the facts and offer suggestions for future projects, will be released by the Ministry in 1980.

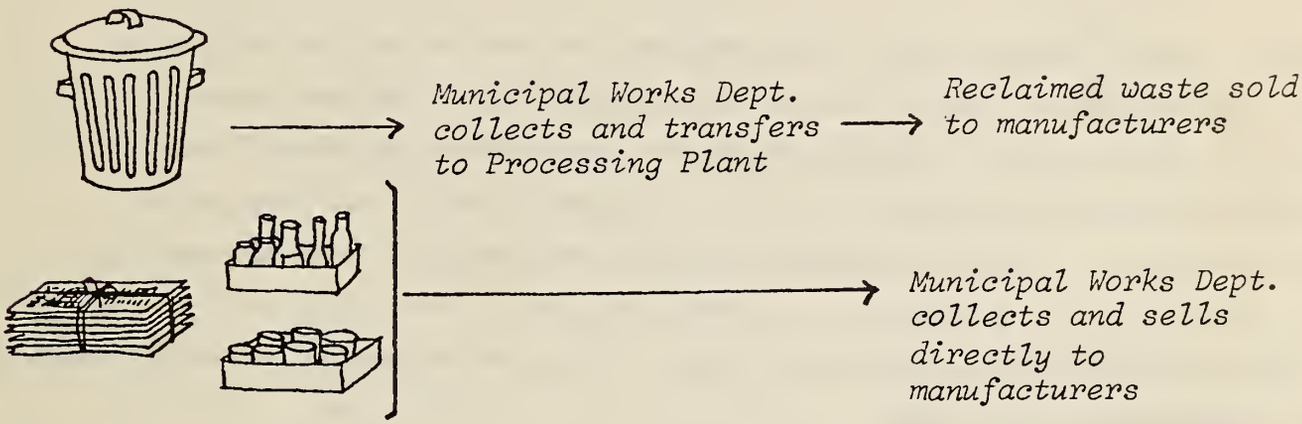
VI. PAPER SEPARATION BY OFFICE WORKERS

Currently all downtown Ontario Government Office buildings are involved in the desk top recycling of office paper.

A new pamphlet entitled, "Guidelines for Office Separation and Recovery of Waste Paper" was prepared by the Ontario Waste Management Advisory Board and is available through the Ministry.

The Ministry feels that these source separation projects are extremely important. The separation of recyclable waste material - newspapers, glass and cans - at "source" in the

home or workplace can be an important element in recovering our resources. As the following schematic indicates, source separated materials can be collected and recycled more directly:



A municipality could thus quite readily turn much of its recyclable waste into a saleable resource without requiring expensive plant facilities. Considering that newspapers, glass, and cans, comprise about 25% of our household waste source separation by householders could assist greatly in simplifying the resource recovery process.

In addition to encouraging the source separation of waste at home and in the workplace, Environment Ontario is also concerned that attitudes about waste change. Thus the aim of the province's separation Projects is not only to start residents recycling via source separation but also to get them think about why so much waste is produced.

Once people look at garbage in terms of waste they can:

- buy less instant waste, i.e. disposables
- reuse and recycle in home, office and school
- separate for recycling and reclamation
- understand the extent and nature of the overall waste problem, and appreciate the need for resource recovery.

II. CONCEPTS AND OBJECTIVES

Our solid waste problems and the opportunities for solving them require the intermediate student to analyse the interrelationship between our lifestyle habits and our environment.

Solid waste itself has been called the third major polluter and its disposal is often a contributor to air and water pollution as well. Solid wastes also represent the loss of valuable resources which are no longer inexhaustible nor inexpensive. These broad environmental issues are of concern to intermediate students as they become aware that their future lifestyle possiblities are being affected by today's pollution and resource problems.

This "Divide and Conquer" unit for Grades 7-10 is intended to outline these broad interrelationships as well as examine practical solutions which students can begin acting on in their daily lives. More specifically the concepts addressed are:

- the environmental implications of our growing solid waste problem
- the consequences of consuming and discarding valuable resources in solid waste
- the community and personal responsibilities necessary for effective waste management and resource recovery

The major objectives for intermediate students participating in the discussions and activities of this unit are

- to understand that solid waste represents a problem and a resource
- to think about and change their wasteful habits
- to become aware of and participate in the new program of source separation in their community

III. LESSON IDEAS

The lessons in this "Divide and Conquer" unit for Grades 7-10 are intended to provide additional background and activities for existing Environmental/Conservation Studies programs or General Science courses. The emphasis is on understanding the scope of our solid waste problems and the practical solutions immediately available. As in the junior unit, the major theme is that garbage is valuable and that by using the 4 R's approach - Reduce, Recycle, Reuse, Reclaim - we can each help in conserving and recovering our resources.

Depending on the depth and scope of activities undertaken, the unit could be completed in 5-10 lessons. Some individual and classroom experiments are included as well as mathematics problems on measuring the amounts of solid wastes we are generating Relevant terminology is also listed for each lesson. Research topics included require either reference texts or in-the-field observations.

The lessons in this unit are centred around three broad topics:

A. SOLID WASTE - THE THIRD POLLUTION
B. CONSERVING AND RECOVERING RESOURCES
C. "DIVIDE AND CONQUER" YOUR WASTE

In the following sections, background information is reviewed for the teacher and specific lessons are outlined. The Appendix lists further resources for teachers to use as background or classroom material.

A. SOLID WASTE - THE THIRD POLLUTION

This introductory section looks at what's in our garbage, the magnitude of the solid waste now generated and how our "throw away" lifestyle is creating problems.

BACKGROUND FOR THE TEACHER

The mere mathematics of our growing amounts of solid wastes are staggering. Each year Canadians dispose of 450,000 cars, 5 billion cans, 22 million tires, 3 billion bottles and jars. Paper products alone account for almost half of every household's weekly garbage. The total solid waste discarded per Canadian averages almost 2 kg daily, for an annual total of 680 kg or the equivalent of a 60 metre high garbage can! Furthermore, preliminary statistics gathered by the Ontario Waste Management Advisory Board indicate that our average daily output is increasing and could exceed 2 kg per person per day in the near future. "Add to this the steady increase in population and you can see why some people predict that we may eventually drown in our own garbage".[1]

But what of the causes? The underlying causes of our waste habits and attitudes are evident in our changing lifestyles. While pioneer Canadians used and reused machinery and clothing until it wore out, Canadians in the 1970's rely on convenience goods, selfservice and disposable packaging, plus fashion not function as the criterion for throwing things out. It is not

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1. *The Garbage Book, Office of Energy Conservation, Dept. of Energy, Mines and Resources Canada, 1976, p.10.*

surprising than an affluent nation like Canada generates 680 kg of garbage per person annually compared to 90 kg per person in India. Packaging alone is the largest component (38%) of waste in most urban Canadian households.[2]

Since 1970, when the Ontario Ministry of the Environment took over responsibility for waste management across the province, sanitary landfill has replaced open dumps as a method of waste disposal.[3] Solid waste is transported to these sites from nearby urban centres. Alternating layers of waste and earth are built up often into the shape of a "hill". Completed landfill sites can be converted into recreational parks and/or ski hills as in Etobicoke's Centennial Park. Landfill sites are nevertheless not the final answer to our waste problems, mainly because they "bury" valuable resources.

LESSON OUTLINES

To introduce students to the nature and magnitude of our solid waste and its related problems this section of lessons examines two broad topics:

1. THE MATHEMATICS OF SOLID WASTE
2. THE PROBLEMS ARISING FROM "THROW-AWAY" HABITS

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2. *The Garbage Book, pp. 14-15*
3. *For further background information, see Facts sheet "Selecting a Landfill Site" prepared by Environment Ontario.*

1. THE MATHEMATICS OF SOLID WASTE

Terminology

- Solid waste: municipal (residential + yard + commercial), industrial, in-plant, instiutional, construction, Refuse: organic, inorganic, Measurement: kilogram, tonne, cubic metre, percentage composition

Discussion

- What synonyms do we have for waste? (garbage, junk, refuse, rubble, rubbish) Distinguish the differences in meaning (eg. garbage includes food waste while rubbish doesn't)
- How are wastes produced and where do they show up? (air, water, land)
- In what way is solid waste the hidden polluter? Why is it also called the "third" pollution?

Activities

- Show film "The Garbage Explosion" or "Garbage" available through the Red Cross Society, school or public library film outlets. Show "Waste Watchers" slide show Part I (slides 1-34) available from Information Services Branch of Environment Ontario (See appendix)

- What's in our garbage? In groups or in a teacher-demonstration lesson have students examine the contents of a cafeteria or home garbage can
  - i) Determine total weight (subtract weight of can)
  - ii) Sort by type of material. It is interesting here to let students suggest the categories and do the sorting into general and sub-categories. Many believe styrofoam is a paper product. Few know the different sub-groups of plastics.[4]

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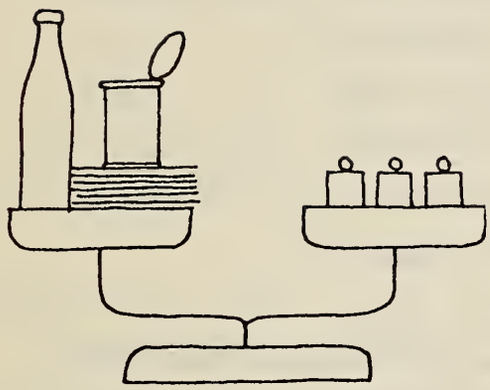
4. *See Plastics Industry Council publication on types of plastics. Address in Appendix.*

Ferrous and non-ferrous metals could be two sub-groups of metals.

iii) Weigh each pile and determine the percentage composition by weight.

iv) Compare the percentage composition of your waste to that determined by Ontario's Waste Management Advisory Board:



Paper		35%*
Food wastes		22%
Yard wastes		15%
Plastic		3%
Rubber & leather		2%
Cloth		2%
Wood		3%
Glass		8%
Metal:	ferrous 7% non-ferrous 1%)	8%
Misc.		2%
		100%

* average over a 12 month period.

<u>OR</u> Compare your figures to the different classifications used in <u>The Garbage Book</u>, pp. 14-15.

- How fast has our garbage been growing? To illustrate how our generation of solid wastes has been multiplying geometrically students can do some quick calculations with the following figures on population and packaging waste:

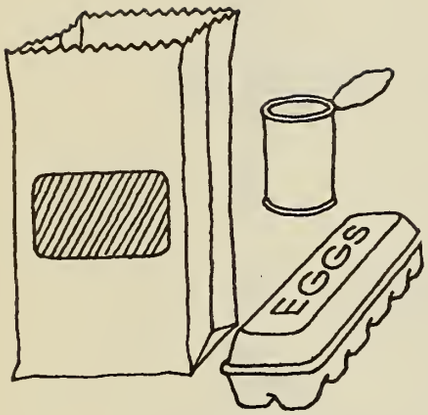
	1961	1976
<u>Population</u>		
- Canada	18 million	23 million
- Ontario	6.2 million	8.2 million
<u>Packaging Waste/Person</u>		
- average annual weight generated	190 kg/person	270 kg/person

Using these figures students can compare:

i) Total packaging waste in Canada/in Ontario in 1961 and in 1976

ii) % growth in population, in packaging waste per person and in total packaging waste.

- How does my family contribute to the problem? Again, focusing on packaging, have student collect and record (and/or bring to class) their family's packaging waste for a week:



i) After the weekly grocery shopping have students unpack and record the number of paper and plastic bags, etc.

ii) After each evening meal, count and record the containers and packages discarded. (If one student collects and brings these in after one week the students will be able to visualize more easily the waste represented by packaging alone).

- To further visualize the magnitude of our solid waste generation have students calculate and make a poster showing how many years it will take their family to produce a "garbage tower" as high as the CN Tower:

i) One person's annual output of garbage equals a 60 metre high garbage can

ii) The CN Tower is 545 metres high

- Finally, students can create bar charts or tables illustrating the overall picture of solid waste production by Ontario families using the following data:

i) Urban solid waste generated per day averages 2 kg/person of which 0.75 kg is produced at time.

ii) 1000 kg = 1 tonne

iii) Population of Ontario in 1977 was 8.3 million

iv) Population of our community is_____

v) Metro Toronto produces 7000 tonnes of solid waste daily. Our community produces _____ % less.

2. PROBLEMS ARISING FROM "THROW-AWAY" HABITS

Terminology • Affluence, disposable, obsolescence, eco-systems, litter, open-burning, dump, incinerator, (electrostatic percipitator, scrubber, residue, emissions) sanitary landfill (compactor, biodegradable, decomposition, anaerobic, erosion, corrosion)

Discussion • North Americans represent less than 10% of the world's population yet consume about 50% of its resources. What items and "hidden" energy do we consume which people in Third World countries don't? Why did pioneer Canadians not produce as much waste/person as ourselves? How does built-in obsolescence add to the solid waste stream? (Note the average life of an automobile from purchase to disposal has shortened from 14 years in 1950 to about 8 years presently)

• Recall from films and/or "Waste Watcher" slide show viewed earlier, the methods to date for disposing of our wastes.

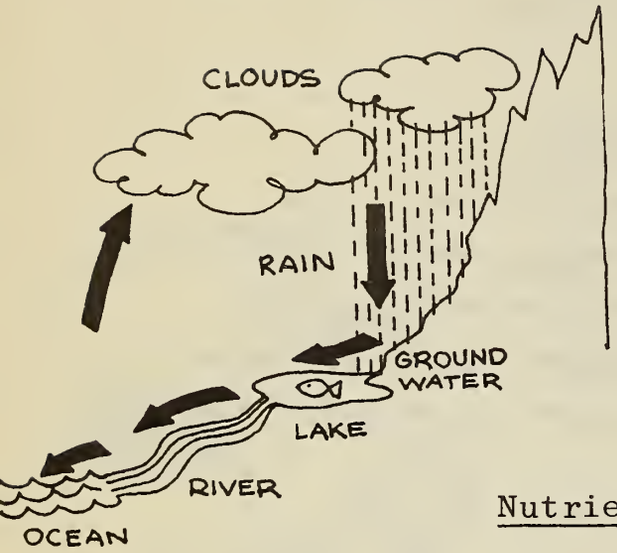
Activities • Review the fundamental interrelationships of an ecosystem such as in a terrarium or aquarium including:

Oxygen cycle - plants give off oxygen as a waste product of photosynthesis

- animals take in oxygen and exhale waste product CO_2

- plants take in CO_2 for photo-

synthesis process



Water Cycle - water in soil taken in by plants and animals

- water vapour containing waste products given off via transpiration from plants and animals

- water also evaporated from any excess water in the system, i.e., soil, pools, etc.

- water vapour from both sources rises, cools, condenses and re-enters the system

Nutrient Cycle - plants take nutrients from soil to produce carbohydrates

- some plants die and through decomposition their nutrients re-enter soil

- other plants eaten by animals and some nutrients returned to soil via animal wastes

- animals also die and decompose thus returning nutrients to system

Emphasize the way in which wastes are absorbed back into the ecosystem cycles naturally.

- Build an ecosystem using instructions from Environment Ontario's Fact sheet.[5]
- Examine man's large ecosystem, how he has introduced solid wastes into the system and how he disposes of them. Compare man's solid wastes and disposal methods to those of animals (eg. beaver's dam, bird's nest, remains from a wolf's meal). Why is it more difficult for man's solid wastes to be absorbed back into our large ecosystem?

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5. *"Constructing a Classroom Ecosystem" is listed in Appendix.*

- Visit the Ontario Science Centre for a workshop called "Ecosystems, Food Chains and Food Webs"
- Identify the types of waste that are generated by the production and consumption/disposal of a tin of beef stew. The main components to trace are meat, potatoes; tin can, paper label. An example follows:

Meat component		Wastes generated
grain to steers	→	grain waste
steers eat grain	→	manure waste
steer slaughtered	→	slaughter waste
beef stew manufactured	→	production wastes (including energy used)
beef in stew eaten	→	table scraps sewage waste

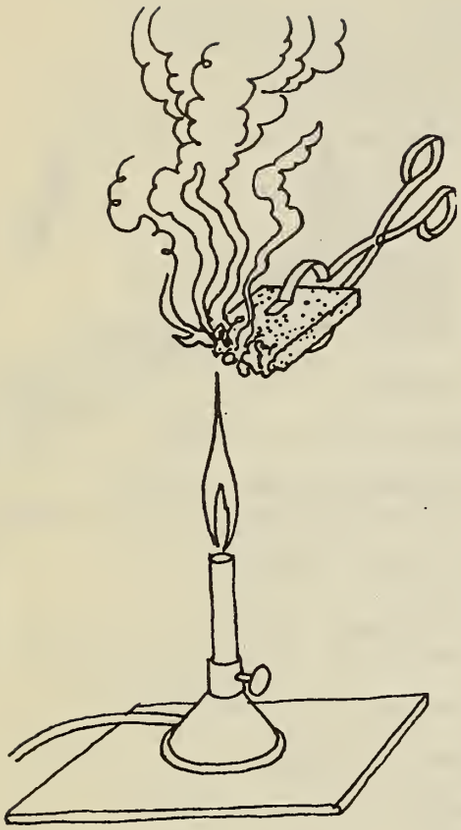
- Experience some of the more direct problems associated with man's disposal systems

(i) Open dumps (aerobic conditions). In a large glass beaker place a layer of soil and on its surface a number of small bits of ordinary household garbage (peelings, newspaper, face tissue, foil wrap, plastic, metal - do not include dairy or meat items because of odour problems). Add water to moisten soil but do not soak. The container may be covered with clear plastic wrap to keep moisture in, but the wrap must be removed for a few minutes daily to supply adequate oxygen.

Observe decomposition, erosion, corrosion and mold formation processes daily for 2 weeks. Molds may be removed and examined

under miscroscope. Conclude on problems of large scale "town dumps" of this kind.

(ii) Open burning and incineration. To simulate the potential air pollution problems associated with open burning and improper incineration, students (or the teacher as demonstrator) can burn several materials in class. This activity should take place in a laboratory with the proper equipment such as goggles, bunsen burner, tongs and a fume hood. Proper ventilation and safety is stressed, especially for styrofoam. Break the class into teams with 5 to 10 materials each to burn. Prepare a data sheet or a chart. Note: initial weight and residue weight of each item burned; colour of flame and smoke; odours produced. Burn a variety of household waste including food, metal, styrofoam (to represent plastics), paper, etc. Discuss the following: Why is incineration considered a popular method of disposal by some people? What happens to the residue of items that do not burn? Are particles detached and carried away in the smoke? What happens to these particles? Why are they harmful to our health? Do you think burning is a good way of disposal? Have the students imagine the pollution effects of burning about 200 tonnes of these materials every day.

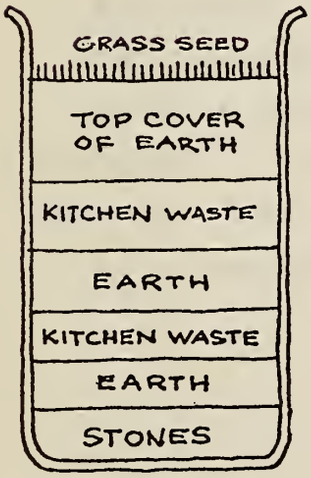


Note that 80 kg of refuse burned in a municipal incinerator generates approximately 1 kg of particulate emissions - both combustible and incombustibles.

Combustibles can be consumed by more efficient burning, incombustible particles can be collected by the stack using electrostatic precipitators and wet scrubbers. To demonstrate how electrostatic precipitators operate, try this experiment:

a. Burn a 5 cm x 5 cm piece of paper and crumble it into small particles
b. Put an electrostatic charge on a small piece of clear plastic kitchen wrap by rubbing it on your shirt or face tissue
c. Hold the wrap stretched out and about 5-10 cm above the ashes and observe.

(iii) Sanitary landfill. Build a mini sanitary landfill site in the classroom using a tall large glass beaker, some earth, household kitchen wastes such as food scraps, plastic wrap, coloured paper towelling, newspaper, aluminum foil lids from tin cans, marbles to simulate glass bottles. Demonstrate how a sanitary landfill site is layered and discuss how the daily earth covering prevents many of the problems associated with open dumps.[6] After adding the final deep earth cover, plant grass, watercress or radish seeds, keep the soil moist until they sprout then water fairly often to simulate how rain would soak through the layers. (Be sure to plant some seeds right next to the glass so their germination and root growth can also be observed).



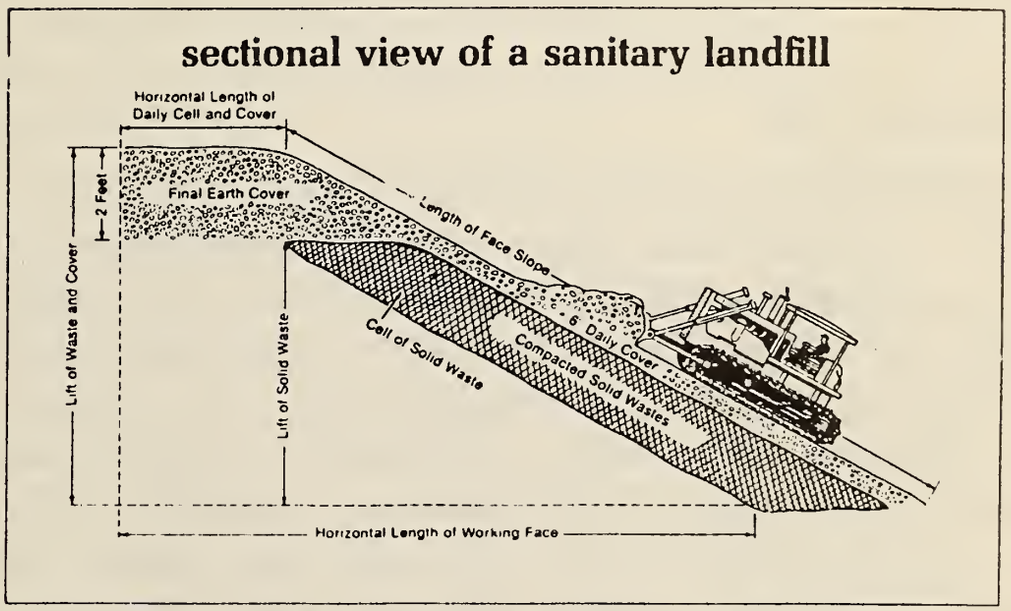
6. *Show videotapes on Sanitary Landfill site available from Environment Canada (See Appendix)*

Keep this sanitary landfill site in the classroom for several weeks, watering regularly to keep moist and observe any signs of decomposition in the layers of kitchen waste. Also note if any leaching of "rusty" or other coloured water occurs down to the bottom layer of stones.

Note that anaerobic conditions may occur if landfill becomes soaked or is too compacted. Pencil holes may be made in the landfill to introduce more oxygen into the system. Also, students may wish to set up such an anaerobic system by building the landfill site in a jar with a tight fitting lid. Decomposition rate can be compared. Do not open jar in the classroom as a considerable amount of methane gas (CH_4) will have built up.

- Compare rates of decomposition in "landfill" experiment to "open dump" experiment. Further activities and information in Fact sheets entitled "A Visit to a Landfill Site" and "Selecting a Landfill Site" available from Information Services, Environment Ontario. Students might debate the merits of possible site locations in their community. Have some represent residents, works department, city government, etc.

- Investigate and find out where your household's garbage goes after it's picked up. Does the works dept. itself look after pick-up or a private firm? To what landfill site does it go? At an average cost of $25 per person in Canada for collection what might the total bill for collection be in your community? What is the cost per tonne of garbage generated by your community's population.



Source: Publication SW-17C, Guidelines for Local Governments on Solid Waste Management, U.S. Environmental Protection Agency.

B. CONSERVING AND RECOVERING RESOURCES

Aside from the obvious disposal problems posed by our accelerating volume of solid waste, we must address the issue of resource depletion. This section examines the renewable and non-renewable resources we are now burying and burning and explores the ways in which individuals and governments can conserve and recover these resources. These require a fundamental change in our attitudes from being consumers to being conservers.[7]

BACKGROUND FOR THE TEACHER

In the economic boom, rapid growth and affluence of the 1960's we developed some very wasteful attitudes and habits. Elaborate packaging - both plastic and paper - developed as manufacturers vied for attention in the marketplace. Self service, fast food merchandising and growing problems with shoplifting all contributed over-packaging and throw-away containers - 4 picture hooks in a plastic bubble pack, styrofoam cups, paper trays, napkins, plastic utensils. Energy and resources were in vast supply and cheap to obtain. The dawning of the age of the consumer had arrived!

However, in the 1970's both our economic and resource pictures have changed. The "unending" cheap supply of energy now has perceivable limits and the monetary and/or environmental costs of obtaining energy have risen. Resources for our diversified products and packaging are neither infinite not inexpensive.

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7. *The Science Council of Canada report, "Canada as a Consumer Society" (Report #27) is available for $2.25 from Supply and Services Canada Publishing Centre, 270 Albert Street, Ottawa, Ontario.*

All of the items in our household waste - both natural and manufactured - can be traced back to the earth's natural resources. Many of these resources - petroleum, iron, bauxite (for aluminum), tin, soda ash, limestone, are non-renewable and in varying degrees of supply. Wood products are made from a renewable resource but our rate of consumption could outstrip our ability to reproduce enough trees unless we keep monitoring the supply and demand. In fact this could possibly happen in the U.S. by the early 1980's. Readily available sources of petroleum in Canada are now predicted to meet our demands only until the early 1980's after which point we will have to rely on alternative energy sources, petroleum purchased from other countries and more expensive drilling and refining methods for processing Canada's remaining petroleum resources.

Studies of the composition of our household wastes indicate that newspapers, glass and cans account for a total of 25% of our daily wastes. This one-quarter of our household garbage contains valuable resources which can be recycled and re-manufactured into new goods. Furthermore if we recycled only half of our food and yard wastes by composting we could reduce our household garbage by a further 10-15%. Finally, by rejecting over-packaged goods and reusing others we could further reduce our household wastes by 10-20%. Not only would this slow down our drain on valuable resources but it would also help address our garbage disposal problems.

The Waste Management Branch of Ontario's Ministry of the Environment is currently involved in areas of research and development. The major undertaking is the experimental facility in Downsview which is the first plant in Canada to combine both "front-end" processing of waste with "back-end" recovery technology in a single facility. The objective is to process a waste stream of up to 270 tonnes of Metro Toronto's waste daily, and produce saleable recyclable materials such as ferrous and non-ferrous metals, organic composting material, a glass mix and baled paper and cardboard. To ensure that these recovered materials re-enter the manufacturing cycle the Waste Management

team is actively seeking out potential buyers and new uses for for the recovered materials. As the quantity and quality of the recovered materials stabilizes, manufacturers will be able to rely more and more on this less expensive source of materials for their operations. Additionally, recovered resources represent savings in natural resources and the money and energy used to extract and refine them. Like the cycles in nature which maintain an ecosystem, we can also recover and recycle valuable wastes within our overall manufacturing/consuming system.

However, the concept of resource recovery does not only involve large scale technological processes. It also involves our personal efforts to act on the concept of conserving vs. consuming our resources. To do this is our daily lives Environment Ontario also advocates:

Reduce your waste - avoid over-packaged and one-use disposable goods; buy returnable containers; Recycle, Reuse and Reclaim your papers, magazines, clothes, organic waste, etc.

Recycle your waste - separate newspapers, glass, and cans for pick-up or depot; be sure to return refillable containers to the store for your deposit.

Reuse your waste - take magazines to the doctor's waiting room, hospital or senior citizens' home; donate used clothing to charity; use food bottles and bags for refrigerating left-overs, pickling, etc.

Reclaim your waste - discover new uses for old packages, twist ties, wood scraps, fabrics, paints; repair old toys, furniture or pass it along; compost food scraps and yard waste.

The following lesson outlines explore these four personal roles in waste management as well as the province's role in large scale resource recovery operations.

LESSON
OUTLINES

To explore the need for conserving and recovering our resources this section examines two questions:

1. IS IT REALLY ALL GARBAGE?
2. HOW CAN WE RECOVER RESOURCES?

The emphasis is on recognizing how we can change our waste habits and attitudes to conserve and recover resources.

1. IS IT REALLY ALL GARBAGE?

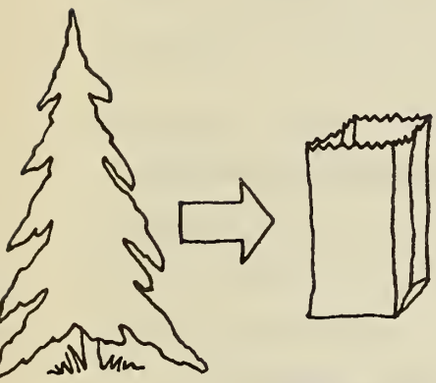
Terminology
- Resources (natural, man-made, renewable, non-renewable) energy, primary and secondary industries, extraction, refining, processing, manufacturing, scrap

Discussion
- Briefly trace the "family tree" of a student or a fictional character to establish the process of tracing origins
- Show students a "bubble/blister" pack of nails or picture hangers, and trace the "family trees" of all the components back to man-made and then natural resources.

Product	Man-made Resource	Natural Resource
Plastic bubble/ blister	Cellulosic plastic (petrochemicals)	Crude petroleum
Cardboard backing		
Nails		

- Determine which of the natural resources are renewable and non-renewable
- How do primary and secondary industries use up energy to produce natural and man-made resources?

Activities



- Make a list of all the operations which require energy in the manufacturing and consuming of a paper grocery bag. Start with a tree being cut down and include all the processing and transportation steps required to get it into the consumer's home. Then continue with the operations necessary to collect it and bury it in a landfill site.
- Have students research and present reports on the natural processes by which crude petroleum, trees and iron ore have been created. The focus should be to explain that the very nature of their creation process makes resources such as petroleum and iron non-renewable. Also note the location and quantities of these resources. Other non-renewable resources could also be included eg., bauxite (for aluminum products), silica (for glass) tin, etc.
- Show "Waste Watchers" Part II (slides 35 to end)
- Other students can prepare reports or presentations on the topic of "SCRAP - the supernatural resource." Background information on the potential value of such "above-ground mining" procedures are available from the Institute of Scrap Iron and Steel Inc. (see Appendix for further information)

- A third research project could cover the extraction and processing methods currently used for both renewable and non-renewable resources. Students could also include an evaluation of the costs - environmental, health, social, monetary - of these procedures and suggest how recycling used materials could reduce these costs. Some other questions to answer might be: How is (iron, etc.) processed into a man-made resource such as (steel)? What wastes are generated in the process? How are they disposed of? What harmful effects do these wastes have on the environment, on people who work at and/or live near the plant?
- Examine tables in The Garbage Book on pages 29 and 31 and have students estimate the BTU's of energy expended for one family's beverage containers in a week, a year.

2. HOW CAN WE RECOVER RESOURCES?

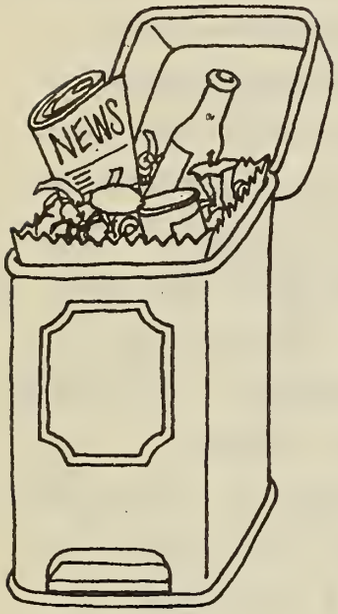
Terminology
- Conservation, resource recovery, reduce, recycle, reuse, reclaim

Discussion
- Read The Garbage Book pp 6-13 and discuss which of the four types of savings - energy, resource, dollar, environmental - are most important to students, to taxpayers, to future generations, to outdoor enthusiasts, to industry and other varied groups of people. Try to bring out the diversity of viewpoints brought to the whole question of conserving and recovering our resources.
- Review the 4 R's and how these can be implemented at home and in larger-scale community operations. Emphasize the importance of

changing habits and assumptions about how things should be.

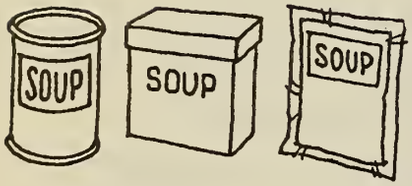
Activities

- As a home project have students sort out one grocery bag full of their kitchen waste. Using the 4 R's list as a guide, record items under such categories as Avoidable (eg., pop cans, non-refillable bottles, paper towels), Recyclable/Compostable, Reusable (re-used in same way), Reclaimable (re-used in a new way), Unavoidable.



For each item under "avoidable" and unavoidable" try to list an item which could have been used instead and which would not have produced waste (eg., a cloth serviette instead of a paper one). Could a better item be invented or brou t back from the past (eg., glass milk bottles) to solve these waste problems?

- At a grocery store students can list and compare the various types of packaging for a category of goods eg., vegetables, soups/soup ingredients, dairy case items, backed goods, toiletries. Consider the following questions: Which packages are recyclable, biodegradeable, cheapest? Are there inserts or display features in the package which are unnecessary? How does the check-out system further over-package these goods? Why are these items packaged as they are (health reasons, display, advertising, etc.) and which are unnecessary?



- Visit the Ontario Science Centre for a workshop on Composting. Write for their hand-out on Composting (see Appendix for details on visits and publications)
- Build a compost unit in class or at home as follows:

i) Fill a container (the size of a classroom wastebasket) half full of soil. The soil should be moist enough to clump together when squeezed in your hand but water should not squeeze out.

ii) Add in mixture of 10 parts vegetable peelings contributed Phosphates and Potassium while animal wastes can be raw or cooked meats or even droppings from the classroom gerbil. Add egg shell too. Stir the whole mix.

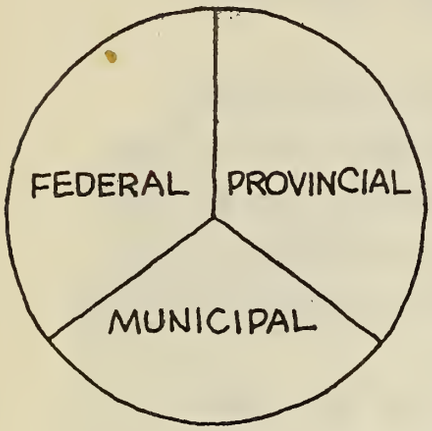
iii) Turn mixture over every day to aerate the soil (aerobic decompostion requires oxygen and keeps compost sweet smelling!)

iv) Contact Ontario Science Centre for a fact sheet and for lesson on composting during your visit to the Centre.

BE IT RESOLVED THAT...

- Students can prepare and debate the methods of resource conservation and recovery advocated by environmentalist groups and the packaging industries. The Appendix lists addresses and/or publications available to teachers for background information on the research to date, philosophies and proposals for future action advocated by different bodies.
- Research and present a report and/or flow chart indicating the functions and responsibilities of federal, provincial and municipal levels of government in planning and executing waste management in Ontario. Students might also include reference to waste management as it affects waterways and the atmosphere.

WASTE MANAGEMENT



Recent legislation and/or proposed legislation at all three levels could also be reported. This research project might overlap into a civics or other history course and students could seek assistance from those teachers as well.

For information about various levels of responsibility for waste management (collection, disposal, long term planning, research, pollution control, legislation, etc., have a student write a letter posing his/her questions to:

i) Information Services Branch
(address in appendix)

ii) Waste Management Branch
Attn: Solid Waste Unit
6th Floor
40 St. Clair Ave. W.
Toronto, Ontario

iii) Environment Canada
Waste Management Branch
Ottawa, Ontario
K1A 1C8

iv) Commissioner of Works Department in your municipality

(Please, only one request per classroom to each of the above.)

- Prepare poster exhibits depicting ways to implement the four R's in a student's daily life.
- Participate in an Ontario Science Centre workshop called "Consumer Waste and Recycling" (see Appendix for details)

- Have students read the article "Trying to Save Our Resources" in the Ontario's Environment Today-1978 tabloid. It discusses the operation of the Experimental Resource Recovery Plant in Downsview. Note the advantages of separating out newspaper, cans and bottles at "source" in the home. What resources are contained in the rest of our non-recyclable household garbage that the experimental plant could recover? How does this type of recovery operation represent an opportunity to make better use of waste than a landfill operation?
  Contact the Ontario Centre for Resource Recovery about a possible tour of the facilities (see Appendix).

C. "DIVIDE AND CONQUER" YOUR WASTE

This section demonstrates how Resource Recovery can be assisted by every household in your community. The emphasis is on how to separate glass, cans, and newspapers at "source" (i.e., in the home) and what to do with these each week. The lesson activities emphasize starting the "Divide and Conquer" habit and checking up on progress over time:

1. GET THE "DIVIDE AND CONQUER" HABIT!
2. HAVE REGULAR "CHECK-UPS"

The focus is on making source separation a habitual action in our lifestyle.

1. GET THE "DIVIDE AND CONQUER" HABIT!

Terminology
- "Divide" (source separate) and "Conquer" (overcome disposal and resource depletion problems)

Discussion
- Students might suggest some of the characteristics of a habit (eg., an action performed regularly without much conscious thought or decision-making). Also "good" versus "bad" habits can be distinguished as well as the process of acquiring a habit.
- Given the characteristics of a student's family and dwelling what might be some of the different ways of incorporating source separation into their lifestyle (who, when, where, how, etc.)

Activities

- Students can weigh their family's weekly garbage bags before they begin a long term source separation project in their homes making use of local recycling depots or special garbage pick-ups.
  - i) Take a bathroom scale to the garbage bag not vice-versa!
  - ii) Weigh yourself with and without the added weight of the bag
  - iii) Calculate the total weight of your weekly garbage

  As a follow-up have students weigh garbage output after source separation begins and note any differences
- Over several weeks, students could record and report on the ways in which their family
  - i) reacted to "Divide and Conquer"
  - ii) did/did not implement source separation
  - iii) encountered difficulties/experienced satisfaction
  - iv) progressed in making a "habit" of source separation
  - v) raised suggestions for further action or information they'd like
- If your community has recycling depots or special garbage pick-ups for separated materials, make up a questionnaire and have each student survey 5 households on their street. Find out if these householders know about the separation program, if they are participating, if not, why not, etc. See sample questions which follow.

QUESTIONNAIRE

1. Do you know about our community's recycling program?
2. a) Do you recycle?
   b) If "yes" then why do you?
   c) If "no" then why don't you?

3. Which is more important to you in recycling (choose one)
   a) Saving money?
   b) Reducing pollution?
   c) Saving resources?
   d) Saving energy?

Ditto a chart format for students to record their survey results individually and then total for the class.

1.	Yes	/5	No	/5
2.	a) Yes	/5	No	/5
	b) Why		c) Why not	
	_____		_____	
	_____		_____	
	_____		_____	
3.	Money	/5	Pollution	/5
	Resources	/5	Energy	/5

- Write up your findings and comments on both of the previous activities in a report and send them to Environment Ontario in care of the Educational Resources Co-ordinator at Information Services Branch, 135 St. Clair Ave. W., Toronto, Ontario M4V 1P5

- Record the weight of newspaper, glass and cans separated weekly. Rank the weights in order. Count the numbers of glass bottles and cans each week. Are all of them unavoidable waste? Are any non-refillable or disposable beverage containers?

2. HAVE REGULAR "CHECK UPS"!

Discussion

- Collect and have students read and comment on any news releases or articles in your local press about waste management activities or disposal problems.

- Four to six weeks after they have begun source separation have students comment on whether their families' initial reactions have changed or remained the same and if source separation is becoming a habit. What makes the habit easy or difficult for their family? What kinds of procedures and containers have their families adopted? Where do they store source separated materials?

  Try to elicit as many different means of incorporating source separation into family lifestyles as possible to indicate the flexibility possible.

Activities

- Students can list and compare the properties and benefits/disadvantages of several types of storage containers they have tried. A report of this information and their conclusions could be sent to Environment Ontario c/o the Educational Resources Coordinator at the Information Services Branch, 135 St. Clair Ave., W., Toronto, Ontario M4V 1P5

- Repeat the survey (done in section 1) 8 weeks later and compare results on the degree of participation in your neighbourhood.
- Calculate the percentage decrease in weight of the weekly garbage put out for regular collection by each students' family. Award a "Conquering Hero" badge to the student whose family managed the greatest percentage decrease.

IV. APPENDIX OF TEACHING RESOURCES

To supplement the lesson ideas described in the previous section a review of additional teaching resources is provided here under the following headings:

A. ENVIRONMENT ONTARIO'S RESOURCE RECOVERY PLANT

B. GOVERNMENT RESOURCES FOR TEACHERS

1. ENVIRONMENT ONTARIO'S INFORMATION SERVICES BRANCH
2. ONTARIO SCIENCE CENTRE
3. ENERGY, MINES AND RESOURCES CANADA
4. ENVIRONMENT CANADA

C. ENVIRONMENTALISTS' PUBLICATIONS

D. INDUSTRY PUBLICATIONS

E. OTHER TEACHER'S GUIDES

APPENDIX A

ENVIRONMENT ONTARIO'S RESOURCE RECOVERY PLANT

Environment Ontario is concerned with managing Ontario's waste and recovering valuable resources by supporting programs which Reduce, Reuse and Recycle and Reclaim our garbage.

To explore the potential of the "fourth" R - Reclamation - the Waste Management Branch of the Ministry has been responsible for developing the Ontario Centre for Resource Recovery in Downsview.

WHY AN EXPERIMENTAL RESOURCE RECOVERY PLANT?

The overall battle against our mounting garbage problem requires several equally important approaches. Manufacturers are being encouraged to reduce disposable packaging; householders are being asked to separate out reusable and recyclable materials from their other garbage; the provincial and municipal governments are developing more efficient garbage handling and large scale recovery operations.

As one part of Environment Ontario's long range plan for recovering resources from our garbage it has recently built the Ontario Centre for Resource Recovery in Downsview. Basically, its purpose is to test out the feasibility of mechanically separating massive tonnages of garbage into reusable materials. Data from the experimental processes will be available to communities considering such operations. In addition, markets (i.e., purchasers/users) for the recovered materials are also being developed.

Such plants are intended to augment Ontario householders' roles in source separating their daily waste. The plants can deal with bulk wastes such as old appliances, commercial and industrial wastes as well as non-separable household wastes. At present the plant is not capable of extracting glass or newspapers in pure form as householders can.

WHAT FURTHER INFORMATION IS AVAILABLE?

Students and teachers interested in the growing amount of research being done into large-scale resource recovery operations can obtain more detailed information on the processes and results of this plant and others like it in the U.S. from:

- Waste Management Branch
  Ontario Ministry of the Environment
  135 St. Clair Avenue West,
  Toronto, Ontario
  M4V 1P5

  Pamphlets describing the plant facilities and operation are available.
  Plant tours can sometimes be arranged for school groups.
  Call (416) 965-6191 for information.
- Information Services Branch
  Ministry of the Environment
  135 St. Clair Ave. W.
  Toronto, Ontario
  M4V 1P5

  Ontario's Environment Today (1977-78) a high school tabloid, contains an extensive article on resource recovery and the Experimental Plant.

- Environmental Action Committee
  156 Fifth Avenue
  N.Y.C., New York
  10010

  The Waste Paper (July 1977), a newsletter, contains an article reviewing "Resource Recovery: Problems and Promises" to date in the U.S.

- National Centre for Resource Recovery, Inc.
  1211 Connecticut Avenue
  N.W. Washington, D.C.
  20036

  In conjunction with the National Association of Secondary School Principals has published Teacher and student guides. Resource Recovery and You provides an excellent overview.

- U.S. Environmental Protection Agency
  Office Of Solid Waste Management Programs
  Washington, D.C. 20460

  Ask for reprints from Waste Age on "Waste Reduction and Resource Recovery - There's Room For Both" by Nick Humber and "Resource Recovery Through Multi-Material Source Separation" by Penelope M. Hansen. This office also publishes a list of "Current recommended readings on resource recovery and waste reduction" Environmental Protection Publication SN-536.

APPENDIX B

GOVERNMENT RESOURCES FOR TEACHERS

1. ENVIRONMENT ONTARIO'S INFORMATION SERVICES

Teachers and students wishing further information on any topic related specifically to solid wastes or to the general area of environmental studies, can contact:

Educational Resources Co-ordinator
Information Services Branch
Ontario Ministry of the Environment
135 St. Clair Ave. W.
Toronto, Ontario
M4V 1P5

Included here are titles of a few of the available Facts sheets and other materials.

- Environment Ontario's Educational Materials - memo
- Envirofacts and Fun - tabloid
- Ontario's Environment Today - tabloid - 1978 edition
- Facts sheets
  - "It's Not All Garbage"
  - "Recycle and Save Our Resources"
  - "About Resource Recovery", June 1977
  - "Marketing - the Key to Success in Resource Recovery", August, 1977
  - "Constructing a Classroom Eco-system"
  - "Simple Composting of Household Waste", June 1977
  - "What Can One Family Do?"
- Guidelines for Office Separation and Recovery of Waste Paper - Brochure
- "1 Recycle" - Bumper Sticker

- The Ratchford Experiment - how one family can fight waste is illustrated in a brochure
- "The Waste Watchers" - a slide show suitable for grades 4-12.
- Waste Watcher and Ogg family (cartoon) posters for the classroom.
- Film - A Matter of Common Sense
  Garbage begins in the home. One family's approach to controlling and recycling waste is related to the broad environmental issue.
  13.5 minutes color.
  This film may be borrowed by writing to Modern Talking Picture Services, 143 Sparks Avenue, Willowdale, Ontario M2H 2S5.

2. ONTARIO SCIENCE CENTRE RESOURCES

The Ontario Science Centre offers Environmental Science programs to students in elementary and junior high school grades. Workshops for teachers' professional development are also arranged. The Centre also publishes hand-outs and a monthly tabloid.

Workshops (Grades 4-8)

- Composting
- Consumer Waste and Recycling

Demonstrations (all grades)

- Papermaking

Hand-outs

- "Ecology Begins at Home"
- "Papermakers of the World Unite"
- "Home Composting"

For further information and to book visits contact:
Ontario Science Centre
770 Don Mills Road
Don Mills, Ontario

3. ENERGY, MINES AND RESOURCES CANADA

Through the federal Department of Energy, Mines and Resources Office of Energy Conservation - three useful teaching materials are available:

- The Garbage Book provides background information for the teacher
- "Garbage Gus" poster for student activity of weighing weekly garbage

  Superkids a "comic book" adventure of energy issues, including an episode dealing with solid waste

For copies of these contact:

Office of Energy Conservation
Dept. of Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4

4. ENVIRONMENT CANADA

The Solid Waste Management Branch of Environment Canada is also undertaking research into the generation of solid waste and into source separation.

For a list of publications available write to "Solid Waste Management Publications and Services"

Solid Waste Management Branch
Environmental Protection Service
Environment Canada
Ottawa, Ontario
K1A 0H3

One of the interesting resources of this Branch for teachers and students is a selection of video tapes on a variety of issues in the solid waste management field. For example:

- "Pay Your Money. Take Your Choice". 58 minutes. A documentary report on the present state of source separation, examining Canadian and American recycling programs, with emphasis on mandatory separation.

- "Guelph's Sanitary Landfill". 28 minutes. The development of a small city sanitary landfill, from design through to construction, as described by Mr. Ray Funnell of the City Engineer's Office, City of Guelph.

- "Sanitary Landfilling". 10.5 minutes. Features the daily operations of Toronto's Beare Road Sanitary Landfill.

- "Solid Waste Utilization". 17 minutes. Resource recovery of several commodities is shown by observing the industrial operations which: 1) de-ink waste paper, 2) de-tin metal cans and other tin-coated ferrous products, 3) shred junked automobiles to recover high grade ferrous scrap, and 4) use glass cullet in the manufacture of new glass containers

- "Composting". 9.5 minutes. The concept of composting waste materials is introduced by observing a composting operation, Grow-Rich Organic Fertilizers, Windsor, Ontario.

- "Earth Search". 24 minutes. The step-by-step evolution of a solid waste management study, using as an actual case a report prepared for St. John's Newfoundland.

- "A New Beginning". 36 minutes. Documents in detail the experimental mandatory source separation projects launched in the winter of 1975 in Somerville and Marblehead, Mass.

- "Sam the Wrecker Man". 18 minutes. Describes the British Columbia government - sponsored auto reclamation program known as Project SAM.

APPENDIX C

ENVIRONMENTALISTS' PUBLICATIONS

The following groups have produced studies, newsletters and/or operate recycling programs. Since these are generally non-profit organizations we suggest that only one student contact them for publications.

- Pollution Probe
  c/o University of Toronto
  Toronto, Ontario
  M5S 1A1

- Garbage Coalition
  43 Queen's Park Cres. E.
  Toronto, Ontario
  (416-928-5432)

- IS FIVE Foundation
  477 Dupont St.
  Toronto, Ontario
  M6G 1Y6

- Outdoors Unlimited Newslitter
  200-1326 Johnston Road
  White Rock
  British Columbia
  (see further details under Teacher's Guides)

- Environmental Action Coalition
  156 5th Avenue
  New York City, N.Y.
  10010
  (see further details under Teacher's Guides)

APPENDIX D

INDUSTRY PUBLICATIONS

The following associations have materials available for classroom use which express industry's point of view on environmental issues and resource recovery. Inquire about any costs for materials when you write.

- CARI - Canadian Association of Recycling Industries, 5799 Yonge Street, Suite 1101, Willowdale, Ontario, M2V 3V3

  Publishes The Second Time Around explaining recycling of metals, glass, etc. in Canada. ($1.25 for one copy - discounts for bulk orders).

- Continental Can Co. of Canada Ltd., 3080 Yonge Street, Toronto, Ontario, M4N 3N1, c/o Mr. Cameron.

  Has available a teaching unit "No Time To Waste" including filmstrip and record data at a cost of about $12.00.

- Glass Container Council Of Canada, 67 Yonge Street, Suite 501, Toronto, Ontario.

  Publishes "Glass Containers and the Environment"

- MCMAC - The Metal Containers Manufacturers Advisory Council Attn: Mr. Bill Apted, American Can Co., 1 International Blvd., Rexdale, Ontario. M9W 1A1

  Has articles and films available on request. Films are:
  i) "Resource Recovery is ...." which describes technology developed to date in the U.S. This film was produced by the National Centre for Resource Recovery.
  ii) "The Last Resource" which looks at the potential for recovering metal containers for solid waste.

- PIC - Plastics Industry Council, 1262 Don Mills Road, Don Mills, Ontario, M3B 2W7

  Publishes a four volume review of plastics - Background, Solid Waste, Environmental Impacts, Resource Recovery.

- ISIS - Institute of Scrap Iron and Steel Inc., 1729 H Street, N.W., Washington, D.C. 20006

  Publishes Phoenix Quarterly containing articles about scrap as a resource. Also pamphlets such as "Scrap is not Junk". (The Phoenix Quarterly, Vol. 6, No. 2 summer 1974 contains an overview of the "Scrap Cycle" from mills to new products to scrap to mills again)

- Crothers Lts. (Canadian dealer for Caterpillar Tractor Co.) Attn: Fred Walden, 1 Crothers Dr., P.O. Box 5511, Concord, Ontario, L4K 1E2.

  Will send out on request a film titled "The Trouble With Trash" reviewing the operation of a sanitary landfill site.

APPENDIX E

OTHER TEACHER'S GUIDES

Several public and private organizations have produced teacher's guides on the topics of Solid Waste and Resource Recovery. Inquire about costs for materials when you write.

- Outdoors Unlittered publishes a student newsletter entitled "Newslitter" and is developing teacher's guides for a "Solid Waste Unit for Elementary Schools" for grades K-6. Contact:

  Outdoors Unlittered
  #200-1326 Johnston Road
  White Rock
  British Columbia

- Edmonton Public School Board sponsored development of Something from Nothing - a Grade Four Environmental Education Unit focusing on Waste Resources. Copies are not generally available for teaching outside the Board, however, inquiries about borrowing a copy may be made to:

  Joy Finlay
  Hazeldean Elementary School
  6715-97th Street
  Edmonton, Alberta

- Environmental Action Coalition publishes a student newsletter Eco-News and a teacher's guide Don't Waste Waste for grades 4-6. E.A.C. also publishes a periodical called "Waste Paper" for the general public. The following Eco-News back-issues are relevant to Environment Ontario's "Divide and Conquer" teaching kit.
  - "The Math of Mess", March 1974 (with Teacher's Guide)
  - "Grandma Was An Ecologist", February 1973 (with Teacher's Guide)
  - "Where Does All The Garbage Go", January 1975 (with Teacher's Guide)
  - "Packaging", January 1973 (with Teacher's Guide)
  - "Make Jewels From Junk", in December 1971
  - "The Birth and Life Of A Piece of Paper", January 1972

For further information contact:

Environmental Action Coalition
c/o 156 5th Avenue
New York, N.Y.
10010

- Keep America Beautiful Inc. has developed individual teacher's guides for grades K-6 on "Waste Handling". These are available from:

  Eliot Pratt Education Centre for Keep America
  Beautiful Inc.
  99 Park Avenue
  New York, N.Y.
  10016

- A "Resource Recovery Education Program" has been developed under the joint efforts of the National Association of Secondary School Principals and National Centre for Resource Recovery Inc. The materials include student and teacher guides in the areas of Resource Recovery and Industrial Arts/Science/Social Studies. Further information available from:

  National Centre for Resource Recovery Inc.
  1211 Connecticut Ave. N.W.
  Washington, D.C.
  20036

Date Due

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